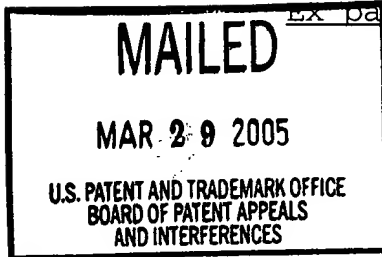


The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex Parte KENT D. CHOQUETTE and JOHN F. KLEM



Appeal No. 2005-0813
Application No. 09/871,492

ON BRIEF

Before WARREN, WALTZ, and DELMENDO, Administrative Patent Judges.
WALTZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the primary examiner's final rejection of claims 1 through 9, 11 through 18, and 20 through 23, which are the only claims pending in this application (an amendment subsequent to the final rejection has been entered by the examiner; see the amendment dated July 18, 2003, entered as per the Advisory Action dated Aug. 20, 2003). We have jurisdiction pursuant to 35 U.S.C. § 134.

According to appellants, the invention is directed to a vertical-cavity surface-emitting laser (VCSEL) comprising a

semiconductor substrate, a pair of mirrors doped n-type sandwiched about an active region which includes one or more indium gallium arsenide nitride (InGaAsN) quantum wells, and a tunnel junction included in a n-type mirror that functions to inject holes into the active region for recombination with electrons to generate lasing action and the emission of light at a nominal wavelength of 1300 nanometers (nm) (Brief, page 3).

Representative independent claim 1 is reproduced below:

1. A vertical cavity surface emitting laser comprising:
a substrate;
a first n-type mirror adjacent the substrate;
an active region including one or more quantum wells, the quantum wells being formed of InGaAsN;
a second n-type mirror adjacent the active region, the second mirror including a tunnel junction for injecting holes into the active region,
wherein the laser emits light at a nominal wavelength of 1300 nm.

The examiner has relied upon the following references as evidence of obviousness:

Lebby et al. (Lebby)	5,956,363	Sep. 21, 1999
Brillouet et al. (Brillouet)	6,052,398	Apr. 18, 2000

The claims on appeal stand rejected under 35 U.S.C. § 103(a) as unpatentable over Lebby in view of Brillouet (Answer, page 3). We reverse this rejection essentially for the reasons stated in the Brief, Reply Brief, and those reasons set forth below.

OPINION

The examiner finds that Lebby discloses a VCSEL comprising a substrate (12), a first mirror (14) adjacent the substrate, an active region (20) including one or more quantum wells (35, 36), with the quantum wells formed of InGaAsN, a second mirror adjacent to the active region, with the laser emitting light at a wavelength of 1300 nm (Answer, page 4). The examiner further finds that the first and second mirrors are unipolar distributed Bragg reflectors that are doped n-type (*id.*). Accordingly, the examiner finds that "Lebby shows *all of the elements of the claims except* the tunnel junction included in the second mirror (*id.*, italics added). Therefore the examiner applies Brillouet for the teaching of employing a tunnel junction in the second mirror stack of a VCSEL for injecting holes into the active region, and allowing the pumping current to be conducted from the top mirror to the active region without a potential drop (Answer, pages 4-5). From these findings, the examiner concludes that it would have been obvious to one of ordinary skill in the art at the time appellants' invention was made "to modify the second mirror of the laser described in Lebby by adding tunnel junction layer as taught by Brillouet to allow the pumping current to be

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conducted to the active region without a substantial potential drop." Answer, page 5.

As correctly argued by appellants (Brief, page 6), the examiner has erroneously found that Lebby discloses all elements of the claims except for the tunnel junction layer. In addition to failing to disclose or suggest a tunnel junction layer, Lebby discloses that the two DBR mirrors should be of opposite p-type and n-type doping contrary to the requirement of claim 1 on appeal that both mirrors be doped n-type (Brief, page 5; Lebby, col. 5, ll. 1-18). Accordingly, where the legal conclusion of obviousness is not supported by facts, it cannot stand. See *In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967).

The examiner has changed the findings of facts and conclusion of law in the Answer in the "Response to Argument" section (Answer, ¶(11), pages 5-6). In this "Response," the examiner implicitly agrees with appellants' argument (Brief, pages 5-6) by finding that Lebby is "only deficient" in two aspects, namely Lebby fails to disclose that the first and second mirrors are both n-type *and* there is a tunnel junction layer included in the second mirror (Answer, sentence bridging pages 5-6). The examiner now applies Brillouet for the teaching of including a tunnel junction layer in a VCSEL as well as requiring

that both mirrors are doped n-type (Answer, page 6). The examiner finds that "the improvement of Brillouet is the tunnel junction combined with the two n-type mirrors" and that in order for the VCSEL of Lebby to "work properly" with the tunnel junction of Brillouet "the improvement must also include the two n-type top and bottom mirrors." Answer, page 6.

When determining the patentability of a claimed invention which combines two known elements, the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination. See *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984); *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984). As correctly argued by appellants (Brief, page 6; Reply Brief, page 2), the examiner has not established why one of ordinary skill in this art would have desired modifying the Lebby structure with the tunnel junction layer taught by Brillouet, which would necessitate changing the doping of both mirrors against the express teachings of Lebby. See *In re Dembiczak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999) (evidence of a motivation, suggestion or teaching to combine may flow from the prior art references themselves, the knowledge of one of ordinary

skill in the art, or the nature of the problem to be solved, but such a showing of evidence must be clear and particular). Additionally, as correctly argued by appellants (Brief, page 7; Reply Brief, page 3), the examiner has not established any factual basis to support the statement that the tunnel junction allows the pumping current to be conducted from the top mirror to the active region "without a potential drop" (Answer, page 5).¹

We note that the examiner has found that Brillouet is "only deficient" in failing to disclose that the quantum wells are formed of InGaAsN (Answer, page 6, apparently referring to claim 1 on appeal). Brillouet discloses that the quantum wells are formed of InGaAsP (col. 4, ll. 37-42). The examiner has not established, on this record, that the use of nitrides and phosphides as quantum well materials were equivalent or interchangeable in this art for the particular VCSEL structure disclosed by Brillouet. To the contrary, the examiner specifically states that in this art "different types of quantum well materials influence the wavelength of the emitted laser

¹We note that the examiner later amends this statement that a tunnel junction layer allows the pumping current to be conducted "without a *substantial* potential drop" (Answer, page 5, last sentence in ¶(10), *italics added*).

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light" and "other references did not cite motivation for using InGaAsN" (Answer, page 6).

For the foregoing reasons and those stated in the Brief and Reply Brief, we determine that the examiner has not established a *prima facie* case of obviousness based on the reference evidence. Therefore we reverse the examiner's rejection of the claims on appeal under section 103(a) over Lebby in view of Brillouet.

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The decision of the examiner is reversed.

REVERSED


CHARLES F. WARREN
Administrative Patent Judge

THOMAS A. WALTZ
Administrative Patent Judge

BOARD OF PATENT
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Romulo H. Delmendo
ROMULO H. DELMENDO
Administrative Patent Judge

TAW/jrg

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